

What is claimed as invention is:

Sub. A1
1. A method for dewatering biological sludge that has been digested by a thermophilic digestion process comprising:

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- a. adding polymeric quaternary ammonium compounds, aluminum sulfate, ferric chloride and blends thereof, as primary component, to the biological sludge; and
 - b. adding polyacrylamidee to the biological sludge; such that any combinations of the primary component and of the polyacrylamidees enhance dewatering of the sludge.

2. The method for dewatering biological sludge according to claim 1, wherein the polymeric quaternary ammonium compounds are from di-allyl di-methyl ammonium chloride (DADMAC) family.

3. The method for dewatering biological sludge according to claim 1, wherein the polymeric quaternary ammonium compounds are from epichlorohydrin di-methyl amine (epi-DMA) family.

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4. The method for dewatering biological sludge according to claim 1, wherein the polymeric quaternary ammonium compound, aluminum sulfate, ferric chloride and blends thereof, are added directly to the sludge and, upon formation of microflocs of the sludge from the polymeric quaternary ammonium compound, aluminum sulfate, ferric chloride and blends thereof, a cationic polyacrylamidee is added to form a floc that dewateres the sludge.

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5. The method for dewatering biological sludge according to claim ¹~~1~~, wherein ratios of the polymeric quaternary ammonium compounds with respect to aluminum sulfate range from about 1:16 to about 1:2.

6. The method for dewatering biological sludge according to claim 1, wherein ratios of

the polymeric quaternary ammonium compounds with respect to ferric chloride range from about 1:8 to about 1:10.

7. The method for dewatering biological sludge according to claim 1, wherein ratios of the polyacrylamidee with respect to aluminum sulfate range from about 1:80 to about 1:8.

8. The method for dewatering biological sludge according to claim 1, wherein ratios of the polyacrylamidee with respect to ferric chloride range from about 1:70 to about 1:7.

9. The method for dewatering biological sludge according to claim 1, wherein polymer concentration to solids ratio of total polymer dosage requirement in relationship to percentage of solids component of the sludge is between about 50 ppm: 1 percent and about 300 ppm: 1 percent.

10. The method for dewatering biological sludge according to claim 1, wherein the polymeric quaternary ammonium compound, aluminum sulfate, ferric chloride and blends thereof, are added directly to the sludge, in an amount sufficient to cause formation of a cationic overcharge within a developed micro floc system, and an anionic polyacrylamidee is then added for final floc formation.

11. The method for dewatering biological sludge according to claim 10, wherein the polymeric quaternary ammonium compound and the anionic polyacrylamidee are in an approximately 1:8 to 20:1 ratio, with the anionic polyacrylamidee having a higher molecular weight than the polymeric quaternary ammonium compound does.

12. The method for dewatering biological sludge according to claim 10, wherein polymer concentration to solids ratio of total polymer dosage requirement in relationship to percentage of solids component of the sludge is between approximately 50 ppm: 1 percent and approximately 5000 ppm: 1 percent.

13. The method for dewatering biological sludge according to claim 1, wherein the biological sludge is mixed with primary sludge.

14. A composition for dewatering biological sludge according to claim 1 comprising polymeric quaternary ammonium compounds, aluminum sulfate, ferric chloride and blends thereof, as primary component, and polyacrylamide, said components being present in the composition in a ratio to enable the composition to function as an agent for dewatering biological sludge from a thermophilic digestion process.

15. The method for dewatering biological sludge according to claim 1, wherein the polymeric quaternary ammonium compounds, aluminum sulfate, ferric chloride and blends thereof, as well as the polyacrylamide, are used in solution, in emulsion or in dry form.

16. A method for dewatering biological sludge that has been digested by a thermophilic digestion process comprising:

- a. adding a polymeric quaternary ammonium compound to the biological sludge; and
- b. adding a polyacrylamide to the biological sludge; such that the combination of a polymeric quaternary ammonium compound and a polyacrylamide and blends thereof enhance the dewatering of the sludge.

17. A method for dewatering biological sludge that has been digested by a thermophilic digestion process comprising:

- a. adding aluminum sulfate to the biological sludge; and
- b. adding a polyacrylamide to the biological sludge; such that the combination of aluminum sulfate and a polyacrylamide and blends thereof enhance the dewatering of the sludge.

18. A method for dewatering biological sludge that has been digested by a thermophilic

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digestion process comprising:

- a. adding ferric chloride to the biological sludge; and
- b. adding a polyacrylamide to the biological sludge; such that the combination of the ferric chloride and a polyacrylamide and blends thereof enhance the dewatering of the sludge.

5 19. The method for dewatering biological sludge according to claim 16, wherein aluminum sulfate is added to the biological sludge, such that the combination of the polymeric quaternary ammonium compound, the aluminum sulfate, and a polyacrylamide and blends thereof enhance the dewatering of the sludge.

20. The method for dewatering biological sludge according to claim 16, wherein ferric chloride is added to the biological sludge, such that the combination of the polymeric quaternary ammonium compound, the ferric chloride, and a polyacrylamide and blends thereof enhance the dewatering of the sludge.

21. The method for dewatering biological sludge according to claim 19, wherein a ferric chloride is added to the biological sludge, such that the combination of the polymeric quaternary ammonium compound, the aluminum sulfate, the ferric chloride, and a polyacrylamide and blends thereof enhance the dewatering of the sludge.

³⁰ 22. The method for dewatering biological sludge according to claim ²⁹ 17, wherein ferric chloride is added to the biological sludge, such that the combination of the aluminum sulfate, the ferric chloride, and a polyacrylamide and blends thereof enhance the dewatering of the sludge.

20 ²² 23. The method for dewatering biological sludge according to claim 16, wherein the polymeric quaternary ammonium compound is from the di-allyl di-methyl ammonium chloride (DADMAC) family.

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24. The method for dewatering biological sludge according to claim 17, wherein the polymeric quaternary ammonium compounds are from epichlorohydrin di-methyl amine (epi-DMA) family.

5 25. The method for dewatering biological sludge according to claim 21, wherein the polymeric quaternary ammonium compound, aluminum sulfate, ferric chloride and blends thereof, are added directly to the sludge and, upon formation of microflocs of the sludge from the polymeric quaternary ammonium compound, aluminum sulfate, ferric chloride and blends thereof, a cationic polyacrylamide is added to form a floc that dewateres the sludge.

26. The method for dewatering biological sludge according to claim 19, wherein ratios of the polymeric quaternary ammonium compound with respect to aluminum sulfate range from about 1:16 to about 1:2.

27. The method for dewatering biological sludge according to claim 20, wherein ratios of the polymeric quaternary ammonium compounds with respect to ferric chloride range from about 1:8 to about 1:10.

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28. The method for dewatering biological sludge according to claim 17, wherein ratios of the polyacrylamide with respect to aluminum sulfate range from about 1:80 to about 1:8.

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29. The method for dewatering biological sludge according to claim 18, wherein ratios of the polyacrylamide with respect to ferric chloride range from about 1:70 to about 1:7.

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30. The method for dewatering biological sludge according to claim 16, wherein polymer concentration to solids ratio of total polymer dosage requirement in relationship to percentage of solids component of the sludge is between about 50 ppm: 1 percent and about 300 ppm: 1 percent.

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31. The method for dewatering biological sludge according to claim ¹⁷21, wherein the polymeric quaternary ammonium compound, aluminum sulfate, ferric chloride and blends thereof, are added directly to the sludge, in an amount sufficient to cause formation of a cationic overcharge within a developed micro floc system, and an anionic polyacrylamide is then added for final floc formation.

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32. The method for dewatering biological sludge according to claim 16, wherein the polymeric quaternary ammonium compound and the anionic polyacrylamide are in an approximately 1:8 to 20:1 ratio, with the anionic polyacrylamide having a higher molecular weight than the polymeric quaternary ammonium compound does.

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33. The method for dewatering biological sludge according to claim 16, wherein polymer concentration to solids ratio of total polymer dosage requirement in relationship to percentage of solids component of the sludge is between approximately 50 ppm: 1 percent and approximately 5000 ppm: 1 percent.

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34. The method for dewatering biological sludge according to claim 16, wherein the biological sludge is mixed with primary sludge.

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35. The method for dewatering biological sludge according to claim 17, wherein the biological sludge is mixed with primary sludge.

36. The method for dewatering biological sludge according to claim 18, wherein the biological sludge is mixed with primary sludge.

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37. A composition for dewatering biological sludge according to claim ¹⁷21 comprising a polymeric quaternary ammonium compound, aluminum sulfate, ferric chloride and blends thereof, as primary component, and a polyacrylamide, said components being present in the composition in

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a ratio to enable the composition to function as an agent for dewatering biological sludge from a thermophilic digestion process.

38. The method for dewatering biological sludge according to claim 21, wherein the polymeric quaternary ammonium compound, aluminum sulfate, ferric chloride and blends thereof,

as well as the polyacrylamidee, are used in solution, in emulsion or in dry form.

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